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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Project	Date	Author

TITLE

FOREST INSECT SURVEY - SEASON OF 1942

YOSEMITE NATIONAL PARK, CALIFORNIA

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by

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Berkeley, California
March 31, 1943

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SUBJECT—

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Forest Insect Laboratory
Berkeley, California
March 31, 1943

FOREST INSECT SURVEY - SEASON OF 1942

YOSEMITE NATIONAL PARK, CALIFORNIA

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ABSTRACT OF RESULTS

A. The 1941 Infestation (complete record)

1. Total timber (all species) killed on reporting areas (Table 2)

a.	Number of trees	4,700
b.	Volume	2,345,000 board feet
c.	Average volume per acre	9 board feet

2. Present classification - low endemic

3. Primary insects: Western pine beetle in ponderosa pine.
Mountain pine beetle in sugar pine and lodgepole pine.
Jeffrey pine beetle in Jeffrey pine.
Fir engraver beetles and Sierra fir borer in fir.
Lodgepole pine needleminer in lodgepole pine.

4. Trend - substantial reduction over 1940.

5. Control work completed - maintenance control in Yosemite Valley and in Mariposa Grove area.

B. The 1942 Infestation (partial record)

1. Total timber (all species) killed on reporting areas (Table 2, estimated)

a.	Number of trees	2,600
b.	Volume	1,386,000 board feet
c.	Volume per acre	6 board feet

2. Present classification - low endemic

3. Primary insects: same as in 1941.

4. Trend - decrease over 1941

5. Control work completed - none

FOREST INSECT SURVEY - SEASON OF 1942

YOSEMITE NATIONAL PARK, CALIFORNIA

Introduction

An appraisal of forest insect conditions in the pine and fir stands of the Yosemite National Park for the year 1942 was made possible as a result of field work conducted by staff members of the Forest Insect Laboratory, Berkeley, California, during the summer and fall periods of that year.

Field work in connection with the setting up of two research plots in ponderosa pine stands, the survey of a third plot previously established in sugar pine type, and measurements of two other plots, one each in lodgepole pine and fir, together with occasional examinations in other timbered areas provided considerable data on recent infestation trends and current insect activity. This work was done by the following members of the Berkeley staff: J. M. Miller, G. R. Struble, J. W. Bongberg, P. O. Johnson, and J. E. Patterson.

In the fall a detailed insect survey was made of the principal pine stands in the western part of the park, and a reconnaissance was conducted through the Tenaya - Tuolumne lodgepole pine region by Struble and Patterson.

These examinations yielded information sufficient to make possible a fairly close estimate of insect conditions, trends, and losses on the park during 1941 and 1942.

The following report is presented in two parts. The first part deals with a description of the research plots now established. The second part is devoted to the annual survey.

RESEARCH PLOTS

The virgin pine and fir stands of the Park offer ideal conditions for long-term studies of tree characteristics which influence insect infestations, since logging is prohibited in these stands and all unnecessary cutting is prevented. These practices maintain a perpetual forest in the primeval conditions necessary for studies of extended duration, and fulfill the requirements of the seven study plots which have been established. The primary purpose of these plots is to study individual tree susceptibility to insect attack and seasonal brood variations, and to measure insect-caused losses. Permission was granted by the Yosemite National Park for the establishment and maintenance of these plots under Park regulations, and these studies would not have been possible without the cooperative interest of the Park Service.

Plot 1. Badger Pass.

This plot of 160 acres was set up in 1939 in a typical stand of white and red fir. It is located on the Glacier Point road near the junction of the Badger ski track road. Its purpose is to study seasonal activity of the engraver beetles, Scolytus ventralis Lec., and Scolytus subscaber Lec., and the Sierra fir borer, Tetropium abietis Fall. Tree selection by these beetles and character and amount of damage caused by them in the southern Sierra region are also objectives of this study.

Plot 2. Mariposa Grove.

This plot of 20 acres was set up in 1941 for the purpose of studying the characteristics of mountain pine beetle, Dendroctonus monticolae Hopk., infestations in sugar pine. It is especially desired to determine if crown characters and tree decadence are indicative of the degree of susceptibility to bark beetle attack. The study requires that a case history be kept of each of the 229 numbered sugar pine trees on the plot. It is located in the south-central part of the Mariposa Grove area in a virgin stand of sugar pine typical of the Sierra region.

Plot 3. Bridal Veil Meadows.

A plot of 20 acres was established in 1941 to study the characteristics of mountain pine beetle, Dendroctonus monticolae Hopk., endemic infestations in lodgepole pine. This study places particular emphasis on tree selection by this beetle in endemic infestations, and the effect of high altitude and low temperatures on brood development. The plot is located on the old Glacier Point road west of the crossing of Bridal Veil Creek.

Plot 4. Horse Flat.

During the summer of 1942 a plot of 20 acres was established in ponderosa pine stands in the Wawona Basin to study individual tree susceptibility to attack by the western pine beetle, Dendroctonus brevicomis Lec. The 570 pine trees on this plot were individually numbered for current and subsequent examinations and were rated as to degree of risk through evidence of crown character and age. This study will require several years for completion. It is planned to maintain case histories on all of the pine trees on this plot for the full course of the study.

Plot 5. Big Meadows.

A plot of 20 acre size was set up in ponderosa pine-sugar pine stands near Big Meadows at the same time the preceding one was established. Conditions on both plots are similiar and the study of each has the same objectives. The plots differ only in altitude and in stand composition. The Big Meadows plot lies at higher elevation and contains a larger percent of sugar pine. A total of 651 pine trees were numbered, measured, and risk rated on this plot.

Results of the studies are not expected to be complete for a number of years.

In addition to the preceding numbered plots records are being maintained on two other plots of long standing in the lodgepole pine stands of the upper park region.

Tuolumne Meadows.

A strip plot 200 feet in width and containing 18 acres was set up in 1918 in lodgepole pine stands on the north side of Tuolumne Meadows for the purpose of studying the after effects of severe defoliation by the lodgepole pine needleminer, Recurvaria milleri Busck. Occasional examinations on this plot have been made during the 24 years which have elapsed since its establishment. Data on the recovery and growth increment of the trees that survived defoliation and subsequent bark beetle depredations have been taken and recorded. It is planned to continue observations on this plot for an indefinite period.

Porcupine Flat.

In 1937 a small plot of five acres was established in lodgepole pine on the campground site near Snow Creek to study the progress of a mountain pine beetle infestation in stands previously defoliated by the lodgepole pine needleminer. Annual loss records have been taken each year since the plot was set up. To make the record complete this study should be continued as long as the beetle infestation persists.

THE ANNUAL FOREST INSECT SURVEY

The 1942 survey was directed toward covering all the reporting units by general reconnaissance methods, using roadside strip measurements and topographic viewing as a basis for loss estimates. The plot cruises were also employed in arriving at these estimates. The results made it possible to complete estimates of the insect damage incurred during the year 1941 and to obtain a partial estimate (approximately 75 percent) of the 1942 damage to timber stands in the reporting areas.

The infestation units set up in 1939 were again used without revision. These units embrace local areas of definite boundaries subject to localized insect activity. The total gross area of all the units constituting the reporting area amounts to 334,720 acres. They are shown on the two maps attached to this report.

Insects Involved - Season of 1942.

The western pine beetle, Dendroctonus brevicomis Lec., and the mountain pine beetle, Dendroctonus monticolae Hopk., were mainly responsible for damage to ponderosa pine and sugar pine respectively. Losses in Jeffrey pine were primarily due to activity of the Jeffrey pine beetle, Dendroctonus jeffreyi Hopk.

Fir losses can be attributed solely to the combined attacks of the engraver beetles, Scolytus ventralis, Lec., and Scolytus subscaber Lec., and to the Sierra roundhead borer, Tetropium abietis Fall. The initial attacks of the engravers in the tops and limbs is frequently followed by attacks of the borer on the main stems.

Bark beetle damage to lodgepole pine was the result of attacks made by the mountain pine beetle, Dendroctonus monticolae Hopk. During the year there was a definite decline in these infestations.

Defoliation by the lodgepole pine needleminer, Recurvaria milleri Busck, was conspicuous and severe on the epidemic areas at Forsyth Pass, and locally north of the Tuolumne Canyon. This defoliator has recently invaded the lodgepole stands at Cathedral Lake south of Tuolumne Meadows, but has not so far developed to epidemic proportions in these stands.

General Infestation Conditions and Trends.

A pronounced decline in insect- caused losses was evident in all pine stands throughout the transition type forests. Similar conditions prevailed in the Jeffrey pine stands of the higher zones. Conditions in the fir forests have remained in about the same status as in previous years, registering only a slight decline in 1942.

Bark beetle damage in lodgepole pine stands decreased during the year. This trend was apparent in all the stands examined which indicates a general improvement in forests of this species. Infestations of the lodgepole pine needleminer, which had shown a tendency to spread from established nuclei in 1941, were not greatly increased during the year. No new areas were found to have been invaded. Epidemic infestations of this insect were found only on local areas where it had previously been well established.

In general, the current insect conditions may be considered satisfactory in all the park forests; with a definite trend toward decreased losses.

Results of the Survey.

As previously stated the ponderosa pine-sugar pine areas were surveyed largely by cruising roadside strips located in stands representative of the reporting units. Because the park roads traverse all of these areas it was possible to locate these strips so that a cross section of each reporting unit was obtained. A tabulation of data secured on the sample strips measured in this year's survey is shown in Table 1.

Table 1. Summary of Ponderosa pine-Sugar pine Losses on Sample Roadside Strips. Western Yosemite National Park Area.

Sample Strip	Timb'd. acreage	Reporting Unit	Timber killed in 1941			Timber killed in 1942		
			Trees	Volume	Volume per A.	Trees	Volume	Volume per A.
RD 1 South Gate	168 A	Wawona Basin	0		0	0		0
RD 2 Alder Cr.	120 A	Wawona Road	0		0	0		0
RD 3 Chinquapin	176 A	Wawona Road	1	4,050	23	1	3,200	18
RD 4 Grouse Cr.	164 A	Tunnel	1	3,060	19	1	1,320	8
RD 5 Crane	244 A	Big Meadows	7	5,240	21	4	4,060	17
RD 6 Hazel Green	108 A	Crane Flat	0		0	0		0
		Averages		1,372	12.6		1,430	8.8

Infestation conditions found on these roadside strips are believed to be highly representative of those prevailing throughout the reporting areas in the westside pine stands. Losses were fairly evenly distributed between ponderosa pine and sugar pine in these stands. Since not more than 75 percent of the 1942 loss was visible at the time these measurements were taken, the values given for that year in the above summary should be increased by approximately 25 percent. The result would approximate the 1941 loss indicating that the infestations have remained static during the last two-year period. This assumption is fully born out by the topographic counts made during the survey of the reporting units.

The general loss estimates given in Table 2 are based mainly upon topographic counts and extensive reconnaissance made of the infestation units previously established in the park forests. Volumes are based on measurements made on roadside strips and on the study plots. The estimates of the 1942 losses have been increased to include the 25 percent that was not visible at the time the survey was made.

Table 2. Virgin Pine and Fir Timber Killed by Bark Beetles.
Estimated losses on reporting areas. Yosemite National Park.
Seasons of 1941 and 1942.

INFESTATION UNIT	Timb'd. Acreage	Species	1941 Season No.of trees	1941 Season Volume b.m.	1942 Season No.of trees	1942 Season Volume b.m.
Bald Mountain	7,800	PP-SP	75	60,000	60	48,000
		Fir	80	60,000	70	54,000
	17,400	PP-SP	70	50,000	60	48,000
Crane Flat		WF	200	140,000	160	110,000
		DF	150	150,000	40	32,000
Big Meadows	4,200	PP-SP	70	55,000	60	50,000
Merced Canyon	1,500	PP	20	12,000	10	4,000
Yosemite Valley	5,000	PP-SP	15	12,000	10	5,000
		DF	15	4,000	10	2,000
Tunnel-Chinquapin	6,000	PP-SP	30	35,000	25	30,000
		Fir	60	40,000	60	40,000
Wawona Road	15,000	PP-SP	50	50,000	45	48,000
		Fir	100	70,000	80	60,000
Wawona Basin	7,000	PP-SP	20	16,000	20	15,000
Mariposa Grove	2,500	PP-SP	15	15,000	10	30,000
		Fir	20	18,000	15	9,000
Chilnaulna Cr.	10,000	PP-SP	35	21,000	25	16,000
		Fir	70	28,000	40	15,000
Kibbie	7,000	JP	70	28,000	No data	
Miguel Meadows	10,000	JP	70	32,000	No data	
Hetch-Hetchy	5,000	JP	35	18,000	No data	
		DF	15	9,000	No data	
Middle Fork	30,000	JP	240	144,000	160	90,000
		LP	630	90,000	240	40,000
		Fir	600	420,000	200	160,000
El Capitan	8,000	JP	90	45,000	70	40,000
		Fir	180	125,000	120	90,000
Sunrise	6,000	JP	70	25,000	40	15,000
Illilouette	25,000	JP	100	40,000	60	25,000
		Fir	70	35,000	60	30,000
Yosemite Creek	14,000	LP	200	40,000	100	20,000
		Fir	300	210,000	180	170,000
Porcupine Flat	9,000	LP	250	50,000	90	160,000
		Fir	160	65,000	80	35,000
Tenaya Creek	2,000	LP	20	2,000	No data	
Echo Creek	10,000	LP	80	16,000	No data	
Tuolumne Meadows	50,000	LP	No data		200	40,000
Bridal Veil	11,000	LP	125	25,000	80	15,000
		Fir	300	90,000	120	40,000
Totals	263,400		4,700	2,345,000	2,600	1,586,000

Conditions on Infestation Units.

A summary of insect losses on the various infestation units which include the principal park forests is given in Table 2. The measurements given in this table show the losses sustained in all the units during the last two-year period, as well as the most recent trends in these infestations.

Stands of ponderosa pine-sugar pine, Douglas fir and white fir constitute the transition type forests which are included in the west-side reporting area. During the biennium decidedly low endemic infestations prevailed in the following units of the area:

Bald Mountain	Yosemite Valley	Wawona Basin
Crane Flat	Tunnel-Chinquapin	Mariposa Grove
Big Meadows	Wawona Road	Chilnualna
Merced Canyon		

The trend of recent infestation on all these units was generally toward decreased losses in all tree species. Pine losses have remained near the level of former seasons, but fir losses have registered a sharp decline. This trend is most pronounced in stands of Douglas fir in Crane Creek and Yosemite Valley units. Prior to 1940 the bark flathead, Melanophila drummondi (Kby), developed epidemic infestations in these stands which reached a peak in that year. During 1941 and 1942 these infestations greatly subsided bringing about near normal conditions. Unless these losses again increase to alarming proportions direct control measures to reduce them need not be undertaken. However, in view of past losses these stands should be carefully watched.

Insect-caused losses in white fir registered a sharp decline during the period. This decline was generally effective throughout the reporting area.

A considerable amount of white and red fir timber was windthrown in the upper reaches of the two southern units, Tunnel-Chinquapin and Wawona Road, during a gale which occurred in February, 1941. In that year, and during 1942, much of this wind-caused slash was infested by engraver beetles, Scolytus spp. and by the Sierra fir borer. So far the successive broods of these insects have remained in the down material, but they may eventually enter living trees when no more slash is available for attack. Conditions here should be closely watched. If epidemic infestations should develop in the standing timber in the vicinity of the slash, they should be checked by control measures in the initial stages and before great damage can occur.

Because of high recreational use the following units were given special attention during the season.

Mariposa Grove.

This grove is another park area where constant use promotes insect hazard. Past epidemic infestations have resulted in the loss of many of the largest specimens of both ponderosa pine and sugar pine. To prevent the recurrence of epidemics, maintenance control is highly desirable. This requires extreme vigilance to detect rising infestations and to check them before they become damaging. The Park Service has long practiced this method of protecting the grove area stands and has, in the main, been successful in this objective. When complete success has not been achieved, the fault has been largely due to incorrect timing of the control work. It is essential that this work be done while the beetle broods are still in the trees.

A thorough examination of the grove stands disclosed that the beetle losses during 1941 amounted to 12 pine and 20 fir trees with the succeeding year's loss somewhat less, indicating decreasing losses in all species. This most recent loss is estimated to aggregate 10 pine and 12 fir trees. This amount of loss is considered minimum for these stands. Since, however, even minimum infestations constitute a potential hazard, they should be closely watched and control measures promptly applied should they show aggressive tendencies.

Yosemite Valley unit.

The floor of the valley is the most intensively used area in the park. Constant use has created a condition in the pine stands whichhas resulted in causing the old, mature trees to become highly susceptible to bark beetle attack. Maintenance control by the Park Service has been successful in keeping losses to a minimum. Continuance of this practice is strongly recommended for this unit. During the biennium, the insect loss amounted to 27 trees killed in 1941 and 10 trees in 1942. These amounts represent the total loss in all species.

The Jeffrey pine type, including also white and red fir, compose the stands of the intermediate zone forests. This reporting area includes the infestation units referred to in the following paragraphs. These units were largely surveyed by topographic reconnaissance and roadside strip measurements.

Decidedly reduced infestations were maintained in 1941 on Kibbie, Miguel Meadows, and Hetch-Hetchy units. These units were not surveyed in 1942.

Infestations during the last two-year period were greatly reduced in all species on Middle Fork, El Capitan, Sunrise, and Illilouette units. The greatest reduction occurred in lodgepole pine stands on Middle Fork unit, where the 1942 loss amounted to less than 30 percent of that of 1941.

In contrast to conditions on this reporting area prior to 1941, when infestations were definitely increasing, the recent trend has been toward decreased losses in all species.

The sub-alpine zone of the upper park region includes lodgepole pine, fire, and hemlock. This reporting area is divided into infestation units corresponding to drainage basins. Since infestation trends are generally similar throughout this area, they are reported on a regional basis. Recent insect conditions on the reporting area have been generally satisfactory, without abnormal activity in any part. The mountain pine beetle infestations in lodgepole pine stands have consistently decreased, although this beetle persists on several local areas in endemic status. These centers remain potential hazards and should be examined periodically to dtect increase in activity of the beetle.

Insect losses in the fir stands have also decreased over former status and are now well below normal for this region.

The well established centers of the lodgepole pine needleminer are still localized in the areas where it has been annually active for the past ten years. While infestations of this defoliator have persisted in epidemic form at Forsyth Pass, and locally north of the Tuolumne Canyon, they have not greatly spread from the initial centers. The lodgepole stands north of Cathedral Lake have been recently invaded by the needleminer, and larvae were discovered in mined needles in the Tuolumne Meadows in August; but these occurrences of the moth in new territory does not necessarily indicate the beginning of epidemic infestations. Widely separated occurrences of larvae have been recorded in past years throughout the lodgepole forests without subsequent developments to increased attack, or even noticeable defoliations.

It is during the flight period only that the insect is capable of migrating from infested stands. Adults appear at two-year intervals and 1943 is a flight year. A survey of the lodgepole stands north of the Merced River is recommended for the fall of 1943 in order to check up on the distribution of the needleminer following the flight of that year.

Recommendations.

Infestation conditions found this year do not appear to call for any special control action of large scale. Due to the generally reduced infestations throughout the park forests, insect losses have reached a very low point; and unless these conditions are radically changed, present management plans can well be limited to frequent examinations of doubtful areas, and maintenance control on areas of high recreational value.

Maintenance control is highly recommended on Yosemite Valley floor; in the Mariposa Grove, and in the Wawona Road screen. It is important that this work be carried out during the periods when beetle broods are still in attacked trees.

Areas where present endemic infestations may become critical due to local conditions should be closely watched. The fir windfall near Badger Pass is outstanding in this category. Should the present engraver beetle and fir borer populations now in the wind-thrown trees become established in the surrounding standing timber, it will be necessary to reduce these infestations by direct control measures.

Present infestations of the mountain pine beetle is a potential hazard to lodgepole pine stands on Bridal Veil unit. Developments on this unit should be watched.

A survey of the lodgepole pine stands north of Merced River is desirable to check on a possible spread of the needleminer from present infestation centers. A survey for this purpose should not be made before September when the new brood is established in needles and can be found.

It is highly desirable that the Park Service continue the detection surveys practiced during recent years.

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT LABORATORY - BERKELEY, CALIFORNIA

FOREST INSECT SURVEY

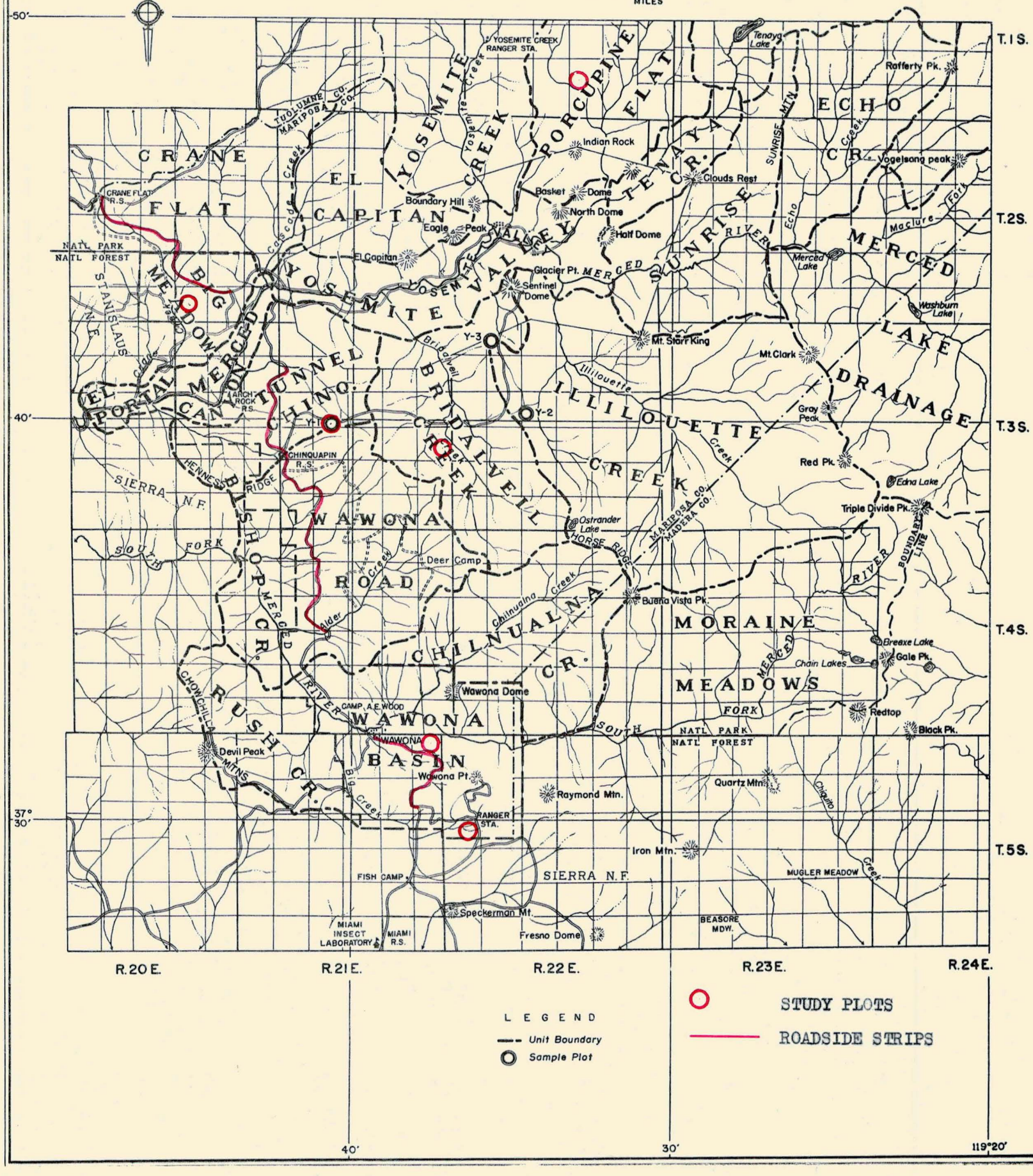
SIERRA-YOSEMITE INFESTATION AREA

MARIPOSA AND MADERA COUNTIES, CALIFORNIA

MOUNT DIABLO MERIDIAN

N

SCALE
0 1 2 3 4 5 6
MILES



LEGEND

Unit Boundary

Sample Plot

STUDY PLOTS

ROADSIDE STRIPS

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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT LABORATORY - BERKELEY, CALIFORNIA

FOREST INSECT SURVEY

STANISLAUS-YOSEMITE INFESTATION AREA

MT. DIABLO MERIDIAN, CALIFORNIA

LEGEND

SCALE 0 ½ 1 2 3 4 INCHES MILES

SAMPLE PLOT

UNIT BOUNDARY

STUDY PLOTS

ROADSIDE STRIPS T2S.

120° 00' 10' 50' 40'

38° 00' 50' 40'

T.3N. T.2N. T.1N. T.1S. T.3S.

R.16E. R.17E. R.18E. R.19E. R.20E. R.21E. R.22E.